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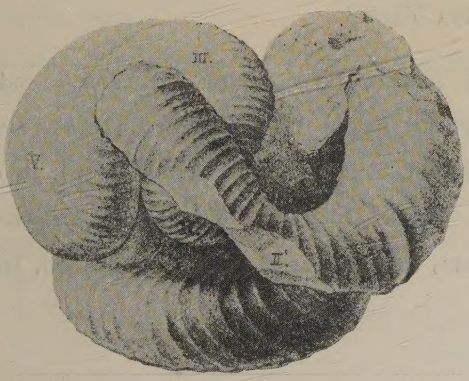

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TRANSACTIONS

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213. ON SOME SPECIES OF *CYCLINA* FROM JAPAN AND KOREA[1)]

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日本及び朝鮮産二三の *Cyclina* について：現棲種 *Cyclina orientalis* (SOWERBY) と化石種 *C. japonica* KAMADA n. sp. 及び *C. asagaiensis* KAMADA n. sp. を記載し，*Cyclinorbis* MAKIYAMA を亞属として再定義した。*C. japonica* 及び *C. lunulata* の古生態を検討した結果，その共産種の性質から，中新世の暖い極めて淺い海に棲んでいた事が明らかになり，又産出上 *Vicarya* 属と密接な関聯性のある事が判る。*C. asagaiensis* は常磐炭田漸新世淺貝層より産し，他種と異なり寒冷性淺海に棲んでいたと推察される。 鎌田泰彦

Introduction:—The genus *Cyclina* is distributed from Cochin China to North Japan and includes the following recent species:

Cyclina sinensis (GMELIN)...Cochin China, China, Philippine Islands, Ryûkyû.

Cyclina flavida DESHAYES...China, Korea, Japan.

Cyclina orientalis (SOWERBY)...Japan.

As fossil the genus has been reported from the Paleogene of northern Kyûsyû (*Cyclina* (?) *nodai* NAGAO and *Cyclina compressa* NAGAO), Hokkaido (*Cyclina*? *shirokiana* YOKOYAMA) and from thereon through the Cenozoic formations of Japan.

During my study on the specimens of this genus, stored in the Institute of Geology and Paleontology, Tôhoku University, I have found two undescribed forms which are dealt with herein.

Before going to the description, I wish to offer my thanks to Prof. S. HANZAWA and Dr. K. HATAI of the Institute of Geology and Paleontology, Tôhoku University, Sendai for their supervision and for reading the manuscript and to Mr. S. NISIYAMA of the Geological Department, Shimane University, Matsue, for his encouragement. Thanks are also due to Messers. F. UEDA, T. AKUTSU and K. MASUDA for kindly donating their specimens for this study.

1) Read June 30, 1951; received Dec. 3, 1951

Systematic Descriptions

Family Veneridae LEACH

Genus *Cyclina* DESHAYES, 1849

1849. *Cyclina* DESHAYES, Trait. Element. Conchy., Vol. 1, fasc. 2, pp. 623-626.

1791. Genotype:—*Venus sinensis* GMELIN, Recent, China Sea.

Subgenus *Cyclina* s. s.

Cyclina (*Cyclina*) *orientalis* (SOWERBY)

Plate 15, Figures. 7a-b.

1855. *Artemis orientalis* SOWERBY, *Thes. Conch. Vol.* 2, p. 661, pl. 144, fig. 79.

1869. *Cyclina orientalis* PFEIFFER in MARTINI u. CHEMNITZ, *Syst. Conch. Cab., Vol. 11*, pt. 1, p. 113, pl. 28, figs. 7-9.; DUNKER, 1882, *Ind. Moll. Jap.*, p. 205.

1920. *Cyclina chinensis* YOKOYAMA, *Jour. Coll. Sci. Imp. Univ. Tokyo, Vol. 39, art. 6*, pp. 119-120, pl. 11, figs. 7, 8.

1936. *Cyclina sinensis* NOMURA and HATAI, *Saito Ho-on Kai Mus. Res. Bull. No. 10*, p. 128. (with full reference prior to 1936; specimens not well preserved.)

1950. *Cyclina orientalis* OYAMA, *Miner. & Geol. Vol. 3*, no. 6, p. 2.

SOWERBY's original description is as follows:

" Art. testâ rotundatâ, ventricosâ, concentricé et radiatim ad latera vix striatâ, pallidé aurantiâ, propé marginem ventralem rubecente; intús margine crenato; lunulâ nullâ."

This species has a shell which is rounder and more solid than *Cyclina sinensis* (GMELIN). The shell sculpture consists of both concentric and irregular striations, which are somewhat raised over the surface and become more elevated toward the extremity; there are crossed with fine impressed radiating striae. Surface covered with nidus and fawn-colored epidermis with a beautiful violet band only near the border. Of the three cardinals in the right valve, the middle is the stoutest, the anterior one is shortest and thin, and the largest or posterior one is slightly arched and bifid. In the left valve, the posterior is longest and thin, the middle and anterior ones are slightly bifid.

As Recent this species has been reported as *Cyclina sinensis* (GMELIN) from many localities in Japan and Korea and as fossil it has been recorded from the Pliocene, Pleistocene and the raised beach deposits of Kanagawa and Chiba Prefectures and the environs of Tokyo. Fossil specimens in the Pliocene Dainenji formation from Aoba-yama and Mukaiyama both in the western part of Sendai City are also identified with *C. orientalis*. Living distribution:—

From Mutsu Bay, Aomori Prefecture, southwards along the Pacific coast to Kagoshima and Nagasaki Prefectures in Kyûsyû along the Tung-hai, and along the Japan Sea northwards to Mikata, Fukui Prefecture. Also west coast of Korea.

Cyclina (Cyclina) japonica KAMADA, n. sp.

Plate. 15, Figures. 1a–b, 2, 4.

1926. *Cyclina chinensis* YOKOYAMA, *Jour. Fac. Sci. Imp. Univ. Tokyo, Ser. 2, vol. 1*, p. 222, pl. 28, fig. 7 (not of GMELIN, 1791).

Shell equivalve, inequilateral, very gibbous, a little higher than long. Anterodorsal margin nearly straight. Posterodorsal border arched, posterior margin subtruncate, ventral border rounded. Beaks bluntly pointed. Sculpture with concentric, fine growth lines, crossed with numerous impressed, fine radiating striae. Pallial sinus triangular. Inner margin of the shell crenulated.

Dimensions (in mm.)	IGPS* coll. cat. no.	Length	Height	Width	*C. (C.) japonica*
Holotype	72952	47.7	50.2	30.9	Both valve
Paratype 1	7110	48.0	50.3	30.1	„
„ 2	„	43.2	45.0	28.5	„
„ 3	52776	44.8	49.0	16.0	Left valve
„ 4	72954	36.0	36.9	22.4	Both valve

* Abbreviation for Institute of Geology and Paleontology, Sendai.

Remarks:—This new species is distinguished from *C. orientalis* by the more ventrally sloping antero-dorsal margin, by the less incurved beaks, by having less angular corner between the postero-dorsal margin and posterior border, and by the more acute apex of the pallial sinus. It is also distinguished from *Cyclina takayamai* OYAMA from the Syobara Miocene (OTUKA, 1938, pp. 32–33) by the large size, more inequilateral aspect of the valves and by the more sloping antero-dorsal margin of the shell.

Localities and formation:—IGPS loc. no. Iw–3; 200 m west of Tokunari, Machino-machi, Fugeshi-gun, Ishikawa Prefecture. (Horyuzan). Lat. 37° 24′ 36″ N., Long. 137° 05′ 20″ E. Type locality; Higashi-Innai formation, Miocene. Holotype.

IGPS loc. no. Gi–4; Shôbasamahora, 1 km. west of Tsukiyoshi, Aki-mura, Toki-gun, Gifu Prefecture. (Mino-Ota) Lat. 35° 22′ 48″ N, Long. 137° 13′ 36″ E. Tsukiyoshi formation, Miocene. IGPS coll. cat. no. 7110. Paratype.

IGPS loc. no. Sh–1; Pass between Ayukawa, Ayukawa-mura and Kurokawa, Yamauchi-mura both of Koga-gun, Shiga Prefecture. (Kamiyama) Lat. 34° 56′ 00″ N., Long. 136° 20′ 43″ E. Kaminohira formation, Miocene. IGPS coll. cat. no. 52776. Paratype.

IGPS loc. no. Fs–13; In the 1st pit of the Taishô Coal Mining Co., Kamiyamada, Yamada-mura, Iwaki-gun, Fukushima Prefecture. (Onahama). Lat. 36° 57′ 07″ N., Long. 140° 57′ 10″ E. Yamada formation, Miocene. IGPS coll. cat. no. 72954. Paratype.

Cyclina (*Cyclina*) *asagaiensis*

KAMADA, n. sp.

Plate. 15, Figures. 3a–c.

Shell rather thin, suborbicular excepting the umbonal region, gibbous, equivalve, nearly equilateral, a little higher than long. Antero-dorsally slightly concave, postero-dorsal margin short and convex, ventral margin rounded. Umbonal region narrow, projecting, beaks situated almost nearly central, small, pointed and inclined inwards. Surface with concentric ribblets crossed by many radial ribs broader than the interspaces. There is a lunule-like area bordered by the narrow groove which extends from the beaks to the postero-ventral corner on the inner side of the shell. Pallial sinus rather small, deep, sinusly ascending, rounded. Inner margin crenulated.

Length of holotype 37.0 mm., height 40.8 mm., width of intact shells 26.6 mm.

Holotype:—IGPS coll. cat. no. 72955.

Remarks:—*Cyclina* (*Cyclina*) *japonica* n. sp. resembles the present new species, but can be distinguished by the smaller and thinner shell, the more projecting umbonal region and by the position of the beaks. The radial ribs of the present new species are stronger than the impressed radial striae of *japonica* or *orientalis*.

Localities and formation:—IGPS loc. no. Fs–11; In the Ômachi abandoned shaft of the Jôban Coal Mining Co., north of Takasaka, Uchigô-machi, Iwaki-gun, Fukushima Prefecture. (Taira) Lat. 37° 03′ 07″ N., Long. 140° 51′ 04″ E. Type locality. Asagai formation, Oligocene (Rupelian). Holotype.

IGPS loc. no. Fs–12; 500 m. north of Yumoto railway station on the Jôban line, Mukaida, Yumoto-machi, Iwaki-gun, Fukushima Prefecture. (Taira) Lat. 37° 00′ 24″ N., Long. 140° 51′ 55″ E. Asagai formation. IGPS coll. cat. no. 72956. Paratype.

Subgenus *Cyclinorbis* MAKIYAMA, 1926. emend.

Type: *Cyclina lunulata* MAKIYAMA, 1926.

Cyclinorbis was proposed by J. MAKIYAMA (1926, p. 158) as a new section of *Cyclina*, based on *Cyclina lunulata* MAKIYAMA from the Miocene Heirokudo formation of North Korea.

Subsequently in 1936 (p. 212), he stated that the features upon which he founded *Cyclinorbis* are also found on some examples of *C. sinensis*, and therefore *Cyclinorbis* may be a synonym of *Cyclina* s. s.

My study of numerous *Cyclina* both fossil and recent leads to that *Cyclinorbis* may be retained as of subgeneric value and can be defined as follows:

Shell suborbicular, a little longer than high, anterior end produced, not so swollen as in *Cyclina* s. s., the umbones are small, the beaks are posterior. Sculpture with fine concentric lines and no radial striae. Crenation of inner margin only on antero- and dorsal borders. Of three rather thin cardinals, only the posterior one in the right valve is bifid.

Cyclina (*Cyclinorbis*) *lunulata* MAKIYAMA

Plate. 15, Figures. 5-6.

1926. *Cyclina* (*Cyclinorbis*) *lunulata* MAKIYAMA, *Mem. Coll. Sci. Kyoto Imp. Univ., Ser. B. vol. 2, no. 3, art. 8.* p. 158, pl. 13, fig. 1.
1936. *Cyclina* (s. s.) *lunulata* MAKIYAMA. ibid., *vol. 11*, no. 4, art. 8. p. 212.
1938. *Cyclina lunulata* NOMURA and HATAI, *Japan. Jour. Geol. Geogr., Vol. 16*, nos. 1-2, p. 5,

J. MAKIYAMA's original description is as follows:

"Shell suborbicular, a little longer than high, inequilateral, moderately convex, thick concentrically finely ribbed. Beaks not much raised, a little convex, acute, approximate, inclined forward, located at about the posterior third. Anterior end produced, broadly rounded, the dorsal margin long, arcuate, slowly declivate; posterior end broader, more elevated, regularly round; the dorsal margin high, short arcuate; ventral margin semicircular. Lunule very small, concealed below the beaks, superficial; there is defined a large oval lunule-like area bordered by a distinct line. Sculpture consisting of fine dense, regular concentric riblets, which are sharpened and elevated at the extremities. Hinge-plate moderately broad, arcuate, with 3 divergent, subvertical cardinals, the right posterior bifid. Posterior dorsal margin crenate within, the other part of the interior margin smooth. Pallial sinus long, subvertical. Height, 47 mm.; length, 49 mm.; diameter, 27 mm."

Remarks:—In this description, J. MAKIYAMA described that the posterior dorsal margin is crenate within but on examination of topotype specimens of this species, it is found that crenations on the margin are restricted to the antero-dorsal border while the other parts are smooth.

C. lunulata is characteristic in its moderate thickness of the shell, which is a little longer than high, produced anterior end, rather small convexity and concentric riblets. By the said features, this species can be distinguished from

C. (*Cyclinorbis*) *lunulata*			
Dimensions (in mm.)	Length	Height	Width
Topotype (IGPS coll. cat. No. 64665)	48.0	49.5	30.2
	46.2	45.5	26.3
	41.3	39.2	21.1
	40.2	39.5	21.5
	33.2	30.7	16.0

the other species of *Cyclina* s. s. This species resembles the Recent *C. flavida* DESHAYES (Pl. 15, fig. 8), but can distinguished from it by having a smooth inner ventral and posterior margin and by the subvertical sinus.

Associated fauna and the ecological significance of *Cyclina*:—

Generally, the Recent *Cyclina* is found living in bays rather than in regions directly in the influence of open seas. In bays, the genus is found flourishing in regions of either brackish-water or pure marine conditions, thus it may be said that the animal is capable of enduring such diverse conditions as in waters of inlets or lagoons or in shallow waters of estuaries where the salinity is relatively dilute.

For example, Matsukawa-ura (Matsukawa inlet) in Fukushima Prefecture, is a typical brackish-water inlet isolated from the open sea (Pacific Ocean) by a well developed sand-bar. Here *Cyclina orientalis* (SOWERBY) is found from the muddy bottom of this inlet in association with the following molluscs;

Ostrea (*Crassostrea*) *gigas* THUMBERG
Meretrix meretrix (LINNE)
Venerupis (*Amygdala*) *philippinarum* (ADAMS et REEVE)
Gastrana yantaiensis CROSSE et DEBAUX
Solen gouldi CONRAD
Mactra veneriformis REEVE
Mya (*Arenomya*) *japonica* JAY
Batillaria multiformis (LISCHKE)
Cerithidea rhizoporarum (A. ADAMS)

It is remarkable that the paleo-ecological conditions of *Cyclina lunulata* and *C. japonica* have close relationship with the genus *Vicarya* as already described by H. YABE and K. HATAI (1938, pp. 161–164).

In the Meisen district of North Korea, *C. lunulata* was found from the Heirokudo formation in association with *Batillaria yamanarii* MAKIYAMA, *B. tateiwai* MAKIYAMA, *Cerithidea kanpokuensis* MAKIYAMA, *Anadara daitokudoensis* MAKIYAMA and *Vicarya japonica* YABE and HATAI. From this assemblage it is readily noticed that the Heirokudo formation was deposited in a bay.

In Tsukiyoshi, Akiyo-mura, Toki-gun, Gifu Prefecture, *Cyclina japonica* occurs abundantly from the lower part of Tsukiyoshi formation in association with *Vicarya yokoyamai* TAKEYAMA and *V. martini* YABE and HATAI. The other molluscs occurring in association are, according to the recent studies of K. HUZITA and S. OGOSE (1950. p. 488) as follows:—

Vicaryella ishiiana (YOKOYAMA)
Cerithium kaneharai HUZITA and OGOSE
"Pseudomurex" minoensis (OYAMA and SAKA)
Trapezium modiolaeforme OYAMA and SAKA
Clementia "papyracea (GRAY)"
Dosinia japonica? REEVE
Dosinia anguloides NOMURA
Sanguinolaria minoensis (YOKOYAMA)
Katelysia nakamurai IKEBE
Lucina yokoyamai OTUKA

The fossils above enumerated do not suggest a typical brackish water fauna, although there seems to be little doubt as to the embayment nature of the sea. The lower part of the Tsukiyoshi formation consists chiefly of tuffaceous fine-grained or silty sandstones. Cones of the pinetree or leaves and carbonaceous materials are frequently found in the formation in association with the molluscs. Judging from the paleontological evidences just mentioned, the paleo-ecological nature of the Tsukiyoshi formation is "one of a sandy or muddy enviroment, probably in the reach of brackish-waters" as already mentioned

by H. YABE and K. HATAI (1938, p. 162).

In the eastern part of Koga-gun, Shiga Prefecture, *Cyclina japonica* occurs from the Kaminohira formation. From the locality where *Cyclina* is found, N. IKEBE (1934, pp. 114–115) listed the following molluscs, namely:—

Anadara cf. *valentula* YOKOYAMA
Trapezium kurodai IKEBE
Dosinia (*Phacosoma*) *japonica troscheli* LISCHKE
Soletellina mincensis YOKOYAMA
Aloides tanabensis? (YOKOYAMA)
Batillaria sp.
Vicarya yokoyamai TAKEYAMA
Vicaryella bacula (YOKOYAMA)

The Kaminohira fauna contains some brackish-water molluscs such as the genera *Trapezium* and *Batillaria*.

In Tokunari, Machino-machi, Fugeshi-gun, Ishikawa Prefecture, Mr. K. MASUDA collected *Cyclina japonica* in association with the following molluscs from his Higashi-Innai formation:—

Anadara daitokudoensis MAKIYAMA
Anadara kakebatensis HATAI and NISIYAMA
Lucinicus yokoyamai OTUKA
Phaxus izumoensis (YOKOYAMA)
Taras ferruginata MAKIYAMA
Vicarya callosa JENKINS
Vicaryella becula (YOKOYAMA)

The fossils from the Higashi-Innai formation suggest that the formation was deposited in shallow water under warm temperate thermal conditions. The occurrence of brackish water genera as *Vicarya* and *Vicaryella* is of interest because it suggests that the conditions then prevailing may not have been pure marine.

From the features described above, it is noticed that both *Cyclina lunulata* and *japonica* flourished in an embayment analogous to the Recent *Cyclina*. No boreal or cold water species are found in association with either of the two mentioned cylinids although warm temperate to subtropical genera as *Vicarya* and *Phaxus* are common. This fact leads to the conclusion that these fossil cyclinids flourished under conditions similar to the two genera mentioned.

Cyclina asagaiensis is one element of the Asagai fauna in the Jôban coal-field. Its occurrence is very rare and is found only from the Uchigo and Yumoto areas. The Asagai formation contains many molluscs and foraminifers which are characteristic of boreal or cold shallow water as already described by K. HATAI and myself (1950, p. 67) and K. ASANO (1949, p. 474). Accordingly *C. asagaiensis* may be a cold water species of the neritic zone.

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Photo. by KUMAGAI

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Explanation of Plate 15

Figs. 1a-b, *Cyclina* (*Cyclina*) *japonica* KAMADA, n. sp. Holotype. IGPS coll. cat. no. 72952. a. Side view of right valve, b. Anterior view of the same. Loc. IGPS loc. no. Iw-3, 200 m. west of Tokunari, Machino-machi, Fugeshi-gun, Ishikawa Prefecture. Higashi-Innai formation, Miocene.

Fig. 2, *Cyclina* (*Cyclina*) *japonica* KAMADA, n. sp. Paratype. IGPS coll. cat. no. 7110. Internal view showing the pointed apex of the pallial sinus. Loc. IGPS loc. no. Gi-4, Shôbasamahora, 1 km. west of Tsukiyoshi, Akiye-mura, Toki-gun, Gifu Prefecture. Tsukiyoshi formation, Miocene.

Figs. 3a-c. *Cyclina* (*Cyclina*) *asagaiensis* KAMADA, n. sp. Holotype. IGPS coll. cat. no. 72955. a. Side view of left valve, b. side view of right valve, c. anterior view of the same: Loc. IGPS loc. no. Fs-11. In the Omachi abandoned shaft of the Jôban Coal Mining Company, north of of Takasaka, Uchigo-machi, Iwaki-gun, Fukushima Prefecture. Asagai formation, Oligocene.

Fig. 4. *Cyclina* (*Cyclina*) *japonica* KAMADA, n. sp. Paratype. IGPS coll. cat. no. 72954. Loc. IGPS loc. no. Fs-13. From the 1st pit of the Taishô Coal Mining Company, Kamiyamada, Yamadamura, Iwaki-gun, Fukushima Prefecture. Yamada formation Miocene.

Figs. 5-6. *Cyclina* (*Cyclinorbis*) *lunulata* MAKIYAMA. Topotype. IGPS coll. cat. no. 64665. 5. Side view of left valve, 6. internal view showing vertically pallial sinus and anterior crenulation. Loc. Nanseki, Meisen-gun, Kankyô-dô, North Korea. Heirokudo formation, Miocene.

Figs 7a-b, *Cyclina* (*Cyclina*) *orientalis* (SOWERBY). IGPS coll. cat. no. 72685. Loc. Matsukawa-ura, Nakamura-machi, Sôma-gun, Fukushima Prefecture. Recent.

Fig. 8. *Cyclina flavida* DESHAYES. IGPS coll. cat. no. 8810. Loc. Mokpo, Zenra-nandô, South Korea. Recent.

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Trans. Proc. Palaeont. Soc. Japan N.S., No. 6, pp. 175—178, May 30, 1952.

214. TWO NEW TRIASSIC ESTHERIANS FROM PROVINCE OF NAGATO IN WEST JAPAN

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長門産の三疊紀貝蝦石2新種:—厚保統上部所産の *Estherites atsuensis*, *Estherites nakazawai* を記載し, その *Estheriina* との関係について附言す。 小林貞一

The occurrence of *Estherites coreanica* (OZAWA and WATANABE) and *Estherites kawasakii* (OZAWA and WATANABE) at Hikiji in the Asa area in Prov. Nagato (Yamaguchi Prefecture) in the lower Noric Kamosho stage of the Mine series has recently been reported (KOBAYASHI, 1951). Two new species, *Estherites atsuensis* and *Estherites nakazawai*, described here, were subsequently discovered by NAKAZAWA in a shale bed of the Atsu series at Hamada of Tsubuta in the same district. This estherian horizon is located between the coal measures of Tsubuta and Akaiwa and lies below the *Halobia* shale containing *Halobia aotii* KOBAYASHI and ICHIKAWA (1950), (i.e. *Halobia multistriata* KOBAYASHI and AOTI, 1943). Therefore the age of the estherians must be either Ladino-Carnic or early Carnic In other words they are the oldest estherians in Japan and probably the oldest among the Mesozoic ones so far known in Eastern Asia.

My thanks are due to Mr. Keiji NAKAZAWA for the privilage of describing them and to Prof. S. MATSUSHITA and Mr. F. KATO for the facility and assistance of this study in my visit to the Kyoto University. The type specimens are kept in the Geological Institute of Kyoto University.

Read Feb. 10, 1952; received Jan. 19, 1952.

Estherites atsuensis KOBAYASHI, new species

Plate 16, figures 1—7

Description:—Carapace valve subelliptical but truncated at about three-quarters of the short diameter of the ellipse by the straight dorsal margin and nearly equilateral, but generally the anterior margin is somewhat more broadly rounded than the posterior margin which is in turn more gently curving on the ventral than on the dorsal side; height corresponds about three-quarters the length; dorsal margin occupies about four-fifths the length of the carapace; umbo terminal; umbonal half or so of the valve more convex than the peripheral zone; growth lines very weak or absent in the umbonal quarter or one-third; in the rest they are distinct, but very fine, widely apart from one another and countable about 12 in the full grown stage; their intervals ornamented by radial lirae.

Specimen	L	H	DM
No. 1	3.75	2.80	2.20
No. 2	3.65	2.70	2.20
No. 4	3.90	3.10	2.50
No. 12	3.90	2.60	2.50
No. 14	5.40	(3.30)	(3.50)

(in cm.)

L: length
H: height
DM: length of dorsal margin

Observation:—Specimens Nos. 1 and 2 (figs. 1 and 2), both right valves, are selected respectively for the holo- and para-type of this species. Their dorsal margin is straight and as long as four-fifths of the valve; the maximum height of the valve runs through the middle of the margin and a little anterior to the middle of the carapace-length. The umbonal half of the valve is slightly depressed in the holotype and somewhat convex in the paratype. Six or seven lines of growth are distributed equidistantly in the more distal part.

In a slab (fig. 9) three valves in the same orientation are all equally depressed dorso-ventrally, while one disposed diagonal to them is compressed obliquely. If the secondary deformation of the outline to this extent is brought into consideration, there is no doubt that a taller right valve (specimen No. 4, fig. 3) and a broader left valve (specimen No. 12, fig. 4) belong to this species, because they agree with the types in most other aspects. They are not much different from the types in height-length proportion, nor the proportional length of the dorsal margin to the valve. Growth lines are countable six in the peripheral zone in the specimen No. 4. These lines are usually very narrow, if compared to their intervals which are nearly equal in breadth.

It is certainly a remarkable fact that the umbonal part is strongly depressed and deformed secondarily in most specimens at hand. This is probably because the part has been more convex than the peripheral zone. Specimen No. 13 (fig. 5) is an external mould of a right valve on which a part of the left valve lies near the umbo. It has seven lines of growth. The umbonal part less than one-third the height is practically smooth. Furthermore it is noted that the valve becomes somewhat more convex in the umbonal half and especially so in the umbonal quarter. Such a swelling tendency can be seen also in the umbonal one-third of the specimen No. 14 (fig. 6) which is the largest. There no growth line is discernible. As the secondary reduction of the convexity is generally stronger in shales, the swell must have been much more prominent. Because the strongly deformed part of the preceding specimens corresponds to the swell in the last two specimens, the part of the former may be interpreted to have been depressed, causing a crack near the margin of the swell in many specimens, No. 12 for example. If so deformed, the position of the umbo is indeterminable, but it can be ascertained to be terminal in the latter specimens.

In the specimen No. 5 (fig. 7) lirae are seen to radiate, occasionally joining or branching, in the intervals near the periphery of the valve.

In summarizing these observations, the distinguishing characteristics of the species are the smooth umbonal swell, paucity and fineness of growth lines, their intervals of uniform breadth, the radial lirae on them and the subelliptical out-

line truncated by the dorsal margin.

Comparison:—It is certainly interesting to see such an umbonal outgrowth of the carapace as seen in *Estheriina* JONES (1897), because, as suggested by JONES for his genus, it shows probably the lateral outgrowth of the soft part in the immature stage. In the Bahian estherians from Brazil, however, the growth lines are usually distinct on the umbonal swell but obsolete or much finer and denser in the peripheral zone. The change between the two portions is more abrupt and distinct in them than in this species.

JONES referred *Estheria limbata* GOLDENBERG and *Cardinia freysteini* GEINITZ from the Carboniferous of Germany to *Estheriina*, although RAYMOND (1946) considers the latter to be a member of his *Pseudoestheria*. In the case of limnic creatures as estherians it is improbable, I think, that the Carboniferous species in Germany are linked with the Cretaceous ones in Brazil through the Triassic ones in Japan. These three groups of estherians can be distinguished from one another in their carapaces. More precisely, the flat peripheral zone is much narrower in *E. limbata* and *E. freysteini* than in *E. bresiliensis*, *E. expansa* and *E. astartoides*. While the growth lines are more developed on the swell in all of them than in the peripheral zone, the reverse is the case of *Estherites atsuensis* as well as *Estherites nakazawai*. Nevertheless, it is not improbable that the umbonal swelling shows similar development in the immature stage. Therefore it is my opinion that the three groups are off-shoots in the similar trend of evolution, but derived intermittently from the main stock of *Estherites* at different times and places. If the subgeneric distinction from *Estherites* sen. str. bears propriety, each of the three groups must be distinguished on the basis of the size of the swelling and the surface ornaments. A new subgenus is, however, deferred to establish for the Japanese species until more is known of the umbonal swell.

Finally the types of this species coincides with *Estheria ovata* LEA in JONES, 1862, in fig. 28, pl. 2, in outline almost perfectly, but the surface aspect is totally different.

Occurrence:—Hamada of Tsubuta in Habu-town, Asa-gun, Yamaguchi Prefecture; in a shale in the upper part of the Atsu series, which is black coloured, but becomes white, upon weathering.

Estherites nakazawai KOBAYASHI, new species

Plate 16, figure 8

The specimen No. 7 (fig. 8) on which this species is founded has an ovate outline, expanding posteally and attaining the maximum height at about one-third from the posterior end. But otherwise it agrees well with the preceding species. The type left valve is 4.45 mm. long and 3.3 mm. high. Although the posterodorsal part is brocken off, its dorsal margin is estimated to be about 3.2 mm. Namely it is a little longer than in the proceding species. Because the height-length proportion is about the same as that of the specimen No. 12, the difference in outline cannot be attributed to secondary deformation.

Among the Asiatic species it is noted in *Estherites sinkiangensis* (CHI), (1931) that the umbonal one-sixth is smooth and about 10 concentric lines outside of it are, like in this species, separated by wide intervals. Its outline is obliquely ovate, but if compared with the preceding, more slender, less expanding antero-

ventrally as well as postero-dorsally. Furthermore no mention is given by CHI of the swelling of the umbonal part.

Occurrence:—Same place as the preceding, but very rare.

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Explanation of Plate 16

Estherites atsuensis KOBAYASHI, new species

Figure 1. Holotype right valve; specimen No. 1.
Figure 2. Paratype right valve; specimen No. 2.
Figure 3. Specimen No. 4; a right valve.
Figure 4. Specimen No. 12; a left valve.
Figure 5. Specimen No. 13; an external mould of a right valve with a part of a left valve near the umbo.
Figure 6. Specimen No. 14; a left valve and a part of a right valve.
Figure 7. Radial lirae in the intervals among lines of growth near the periphery; specimen No. 5.×40.7

Estherites nakazawai KOBAYASHI, new species

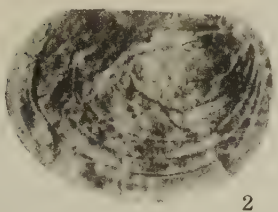
Figure 8. Holotype left valve, specimen No. 7.

Estherian shale of Hamada near Tsubuta

Figure 9. A slab showing the mode of deformation of four valves aligned in two different directions; specimen No. 10.×4.5

All figures ten times magnified unless noted.

All specimens are kept in the Geological Institute, Kyoto University.



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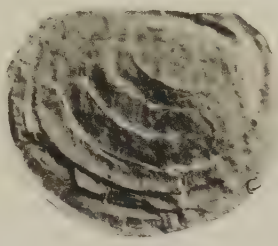

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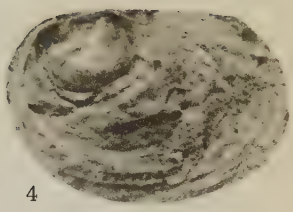

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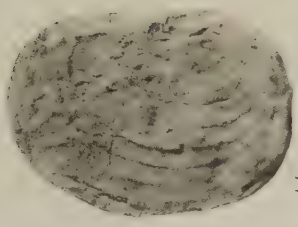

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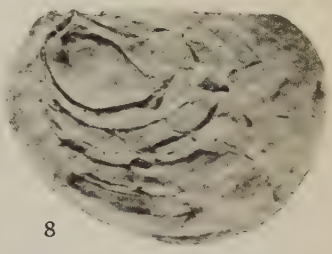

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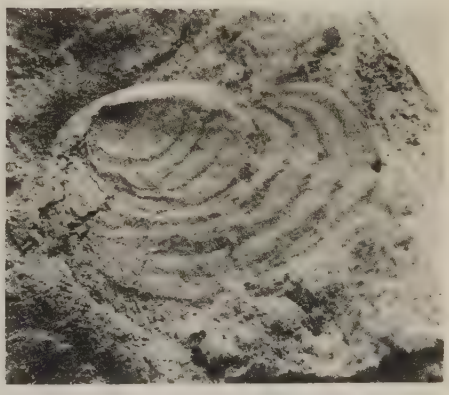

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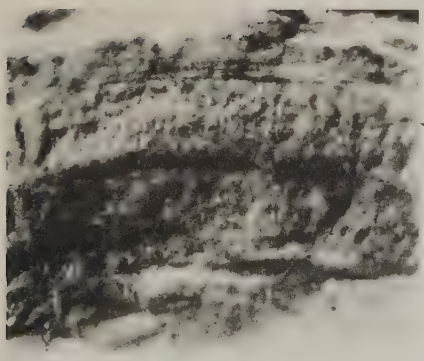

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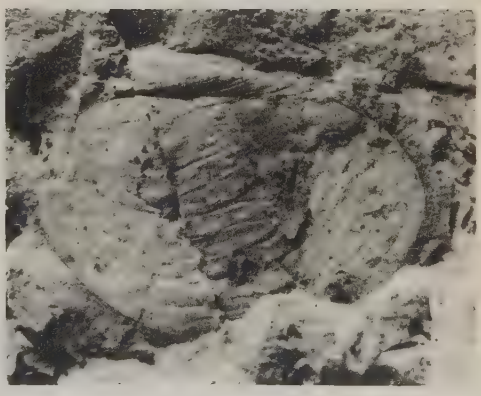

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Trans. Proc. Palaeont. Soc. Japan. N.S., No. 5, pp. 179–183, 1 text-fig. May 30, 1952.

215. A MIOCENE CRAB, *HYAS TSUCHIDAI* N. SP. FROM THE WAKKANAI FORMATION OF TESHIO PROVINCE, HOKKAIDO

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稚内層産ツチダノヒキガニ： 北海道天塩国豊富村沙流沙流別パンケエペコロベツ川支流南岸，豊富ロータリー 2 号井の櫓下の稚内層より土田定次郎により採集されたツチダノヒキガニは寒流系の現生種 *Hyas coarctatus* LEACH 等に近縁を有する。従来 Austria, Preding の Helvetian より *Hyas meridionalis* GLAESSNER, 1928 が Algeria, Oran の Sahelian より *Hyas oranensis* VAN STRAELEN, 1936 が報告されている。 今泉力蔵

The fossil crab described herein was collected by Mr. T. TSUCHIDA of the Teikoku Oil Company from the upper Miocene Wakkanai formation at Saro, Toyotomi-mura, Teshio Province, Hokkaido, along the south bank of the Sarubetsu, a tributary of the Pankeepekorobetsu and kindly submitted by him to the writer for study.

The writer proposed a new specific name *Hyas tsuchidai* for this fossil form, the specific name was dedicated to the collector of the specimens.

All the recent species of the genus *Hyas* are the inhabitants of the Arctic circle, except for only one subspecies, *Hyas coarctatus ursinus* RATHBUN, which is now known to be distributed from the Okhotsuk Sea to Amoy along the South China Sea via the Japan Sea, as stated below again. The exceptional distribution just mentioned is evidently controlled by the cold Liman stream. Therefore, the occurrence of the fossil crab suggests that the Wakkanai formation which has yield this species was deposited in the same ecological condition as the Recent species of the genus are governed. The first described fossil species *Hyas meridionalis* GLAESSNER was found in the Helvetian stage of Wenzeldorf, Preding, Austria. This fossil record from Austria seems to me to indicate the influence of a cold current in that region during that period.

The writer wishes to express his sincer thanks to Mr. T. TSUCHIDA for his kind offer of the fossil crab, and also to Dr. H. YABE, Prefessors S. HANZAWA and K. ASANO and Dr. K. HATAI of the Institute of Geology and Paleontology, Tohoku University, for their encouragement.

Family *Majidae* ALCOCK

Subfamily *Hyasteniinae* BALSS

Genus *Hyas* LEACH 1814

Genotype, *Hyas araneus* (LINNAEUS), RATHBUN, M. J., 1925, U. S. Nat. Mus. Bul. 129, Smith. Inst., p. 252.

Hyas tsuchidai IMAIZUMI, n. sp.

Preservation:—one carapace and its impression preserved in a gray tufface-

1) Read June 30, 1951; received Feb. 5, 1952.

ous fine sandstone. It is compressed towards the right frontal direction but exposes the left lateral side and the orbital cavity as a result of the left supra-orbital eave and the left post-ocular cup being shoved towards the frontal region. Right branchial regions with numerous wrinkles extending from the posterior margin to the anterolateral, due to subsequent pressure.

The color of the fossil is brownish sepia. Convex parts of the carapace and the tops of the tubercles are worn, but the concave surface of the impression is well preserved. Appendages lost.

Description:—carapace broad, sub-triangular of lyrate in shape, but narrower than the post frontal length. Rostrum triangular, flat, bifid, a narrow cleft between rostral horns, the tips more or less separated; tips of horns subacute. Cavity of orbit oblong-spheroidal. Post-orbital and hepatic region not dilated laterally, antero-lateral margin of hepatic region sharp with a rounded postero-lateral angle. Postero-lateral margin of carapace rounded. Cervical groove distinct, marginal line interrupted by a small and shallow sinus between hepatic and branchial regions. Surface uneven, ornamented with granules and granular tubercles, especially on median gastric area or proto- and meso-gastric regions and in an oblique row on branchial region. Meso-gastric region with two large median tubercles. Proto-gastric region with two inner and three outer tubercles arranged side by side: the inner two tubercles in proto-gastric region continue with smaller ones to frontal region. Pustules on inner side of outer surface of horns of rostrum decrease in size anteriorly. Row of tubercles along boundary between meso- and meta-branchial regions distinct. Lateral margin of carapace tuberculate behind hepatic rigion. Outer surface of rostrum densely granulate. Granules on gastric, cardiac and intestinal region also densely arranged. Epi- and meta-branchial regions distinct.

Dimensions:—carapace, length 16mm. width 13mm.
rostrum, width 2.5mm.
proto- and meso-gastric region, width 5mm.

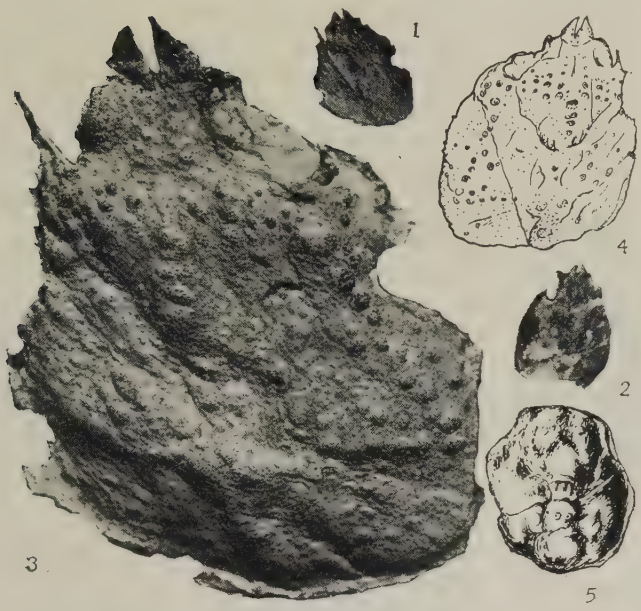
Holotype:—IGPS coll. cat. no. 74001.

Locality and geological horizon:—IGPS loc. no. Te-10. Under the derick of the boring "Toyotomi" Well no. 2 of the Teikoku Oil Co. at Saro on the bank of the Sarubetsu, a tributary of the Panke-epekorobetsu-gawa, Sarobetsu, Saro, Toyotomi-mura, Teshio Province, Hokkaido, (Toyotomi sheet), Lat. 45°4′ 43″ N., Long. 141°50′ 10.″4 E., Wakkanai formation, upper Miocene. T. TSUCHIDA coll. 1950.

Geographical distribution of the Recent species of the genus *Hyas*:—According to RATHBUN (1925, pp. 252–281) and SAKAI (1934, p. 295, 1935, p. 94), this genus is now living in Arctic Ocean with the exception of the Siberian coast between Long. 147°E. and the Kara Sea, south of Novaya Zemlya and of the American coast between Baffin Bay and Langton Bay, North West Territories; Bearing Seas in the Arctic circle, besides, North Pacific Ocean southward along the Asiatic side to Korea and perhaps Amoy, and on the American side to the state of Washington; North Atlantic, Cape Hatteras, North Carolina, and on the European side to the English channel.

The geographical distribution of the species.

1. *Hyas araneus* (LINNAEUS), (RATH-



A Miocene Crab, *Hyas Tsuchidai* n. sp. from the Wakkanai formation of Teshio Province, Hokkaido.

Text-fig. 1. *Hyas tsuchidai* IMAIZUMI n. sp. Holotype, ×1.

Text-fig. 2. Impression of holotype, ×1.

Text-fig. 3. The same specimen as text-fig. 2, enlarged to show details, ×5.

Text-fig. 4. Holotype restored, ×2.

Text-fig. 5. A copy of *Hays meridionalis* from GLAESSNER's fig. 15, Taf. III.

BUN, 1925, p. 258), type-locality, North Sea.

West coast of Greenland from Lat. 69°15′ to 64°11′ N., Labrador at Hebron, about 60°E., in Kara Sea,? Atka, Aleutian Isls.

The species ranges from tidal zone to 500 meters in depth with a temperature gradient of 29.°7-64.°5 F., (RATHBUN, 1925, pp. 255–257, 1925, p. 270). The bottom materials from where the species has been collected comprises sands, pebbles and gravels and broken shells, rarely silts (RATHBUN, 1925, pp. 255–257).

2. *Hyas coarctatus* LEACH, (RATHBUN, 1925, pp. 259–268), type locality, North Sea.

From West (Lat. 70°25′ N.) and East Greenland (Lat. 60°N.) to Hudson Strait and Bay, thence southward via Kamtchatka and Sakhalin Isl. to Yeso Strait and through the Sea of Japan to Korea (Lat. 37°02′ N.); subspecies, *ursinus* RATHBUN, Shanghai, Amoy (Lat. 24°30′ N.)

Iceland, Arctic coast of Europe to Long. 49°30′ N.

Corst of Siberia and northward, as far west as Bennett Isl. (about 147°E.) as north as 76°50′ N. to East Cape.

The species ranges from low water mark to 682 meters in depth with an exceptional record of 1656 meters in depth (W. Atlantic). The temperature ranges from 29.°8-52.°9 F. (RATHBUN, 1925, pp. 260–268). The bottom materials comprises silts, sands, pebbles, gravels and shells (RATHBUN, 1925, pp. 260–268).

T. SAKAI (1934, p. 295) reported two female specimens in the collection of the surveying ship Oshioro-maru of the Fisheries Department of the Hokkaido University from the East China Sea (loc. unknown), subspecies, *altaceus* BRANDT. T. SAKAI states that *Hyas coarctatus* has never been recorded from the Pacific side of Honshu of Japan.

3. *Hyas lyratus* DANA, (RATHBUN, 1925, p. 275), type locality, Oregon coast.

Bearing Sea, from a line connecting Bearing Isl., Commander Isls., Siberia, with Pribilof

Isl. and Bristol Bay, Alaska (greatest Lat. 58° 38′30″ N.), southward to Admiralty Inlet, Washington (about Lat. 48°N.).

This species ranges from 9 meters to 440 meters depth (RATHBUN, 1925, pp. 271-275). The bottom materials comprises silts, sands, pobbles, gravels and broken shells (RATHBUN, 1925, pp. 271–275).

Geological and geographical distribution of the fossil species of the genus *Hyas* ever recorded.

1. *Hyas meridionalis* M. F. GLAESSNER, 1928, (text-fig. £), type locality,

Wenzeldorf of Preding, Austria, sandy silt, Helvetian, and Gamlitz, torton Leithakalk, Baden, Korallenkalk of Rauchstallbrun, coll., Joanneum Graz.

2. *Hyas oranensis* V. VAN STRAELEN, 1936, type locality, Oran,

Algeria, limy rock, Sahelian, depository, Muséum national d'Histoire naturelle, Paris.

Remarks:—According to M. F. GLAESSENR's description of *Hyas meridionalis*, "Die Verwandten der Übringen Tertiärfauna unseres Gebietes finden sich dagegen grösstenteils in tropischen Meeren, zum geringeren Teil ins Mittelmeer." The specimen of *Hyas meridionalis* is incomplete, its carapace is very convex, especially in the gastric region, the hepatic region is dilated laterally but less weiter than *Hyas coarctatus*. The surface of *Hyas meridionalis* is covered with granules and pustules, the pustules on the cardiac region being very distinct.

Hyas tsuchidai is distinguished from *Hyas meridionalis* by the ornamentation of the carapace. The hepatic region is larger than the intestinal region in *Hyas tsuchidai* but the reverse in *Hyas meridionalis* and from *Hyas oranensis* by the ornamentations of the gastric and cardiac regions. It is also distinguishable from the Recent species of the genus *Hyas* as stated below, the rostrum of *Hyas araneus* resembles *Hyas tsuchidai* but the one of *Hyas tsuchidai* is broader and the posterior angles of the hepatic projection of the former species subacute but the later has broadly rounded posterior angles of the hepatic region. The ornamentation of the surfaces of the carapace differs in both species.

From *Hyas coarctatus*, the shapes of the carapace, the rostrum and the hepatic region and the ornamentation of the carapace serve to separate *Hyas tsuchidai*. The shapes of the proto- and the meso-gastric regions are similar in both *Hyas lyratus* and *Hyas tsuchidai*.

Hyas tsuchidai resembles *Hyas araneus* in the shapes of the gastric regions and *Hyas lyratus* in the shape of the rostrum.

Dimensions of the carapace of Recent species are as follows,

		(length)	(width)
Hyas araneus	(RATHBUN, 1925, p. 258)		
	female	72.4mm.	54mm.
	male	94mm.	72mm.
	male, Iceland	110mm.	86mm.
Hyas coarctatus	(RATHBUN, 1925, p. 269)		
	male, altaceus, Grande Bands	80mm.	64.5mm.
	male, west Greenland	99mm.	74mm.
	the largest specimen of America, male	30.2mm.	19 7mm.
	the largest specimen known of the typical form, male, Murman Sea	51.5mm.	35mm.
Hyas lyratus	(RATHBUN, 1925, p. 275)		
	male	105mm.	80mm.

The length of the carapace of *Hyas oranensis* from the Sahelian of Oran, Algeria is more than 30mm. and its width more than 34mm. The fossil species from the Helvetian of Austria and from the upper Miocene of Japan are both small in size, and they may be considered as dwarf species.

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Memorial to Thomas Wayland VAUGHAN

By Shoshiro HANZAWA

Dr. Thomas Wayland VAUGHAN, one of America's most distinguished scientists passed away on January 16, 1952 at the age of 81 in Washington, D. C. He was born in Jonesville, Texas on September 20, 1871.

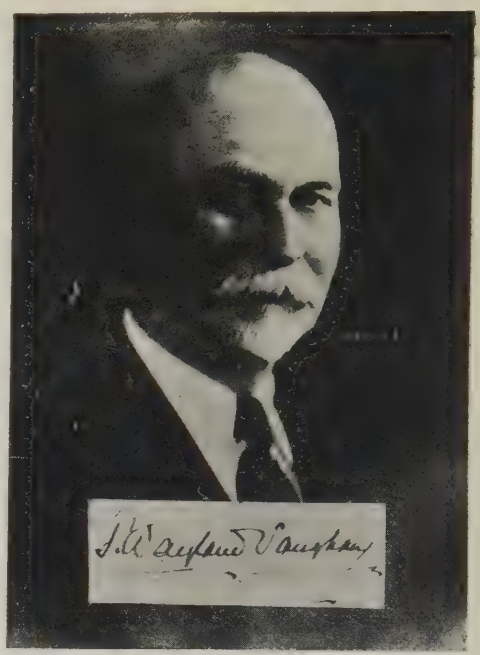
After he received a B. S. degree from Tulane University in 1889 and a M.A. and a Ph. D. degrees at Harvard University in 1894 and 1903, respectively, he served as geologist in the U.S. Geological Survey from 1907 to 1939. He was also attached as paleontologist to the National Museum, Washington, D.C. from 1924 to 1942. He was Director of Scripps Institution of Oceanography, University of California at La Jolla, California in 1924-1936. and was appointed Director Emeritus thereafter.

Dr. VAUGHAN was devoted to the study of the Cretaceous and Tertiary larger Foraminifera and Corals from southern states of North America, Central and South Americas and the West Indies, and of the Recent corals of Hawaii and Torres Strait. He extended his research to problems relating to configuration of the ocean bottom, marine sediments, and ecology of marine organisms, and made a great contribution to the coral reef problems.

He was the author of many new species and several new genera of Cretaceous and Tertiary Foraminifera and corals from the aforementioned regions. In recognition of his great paleontological achievement, his name was dedicated to many foraminiferal and coral species and genera by various authors.

For his brilliant accomplishment in the scientific world, he was awarded an LL. D. by the University of British Columbia in 1933 and by the University of California in 1936, an honorary D. Sc. by Tulane University in 1944, Agassiz medal of the National Academy of America in 1935, the Mary Clark Thompson medal in 1945, and the Penrose medal of the Geological Society of America in 1946. He also served as President of the Geological Society of America in 1936.

His personal contact with the Japanese scientists begun in 1920 when he was one of the American delegates to the



First Pan-Pacific Science Congress, Honolulu, Hawaii. He came twice to Japan. His first visit to Japan as one of the American delegates to the Third Pan-Pacific Science Congress, Tokyo was in 1926. During his second visit to Japan on his trip around the world in 1933, he was gracefully granted by Emperor Hirohito of Japan in private audience. He was awarded by the Japanese Government the Order of the Rising Sun, third class and a beautiful vase cloissonné. He was well acquainted with the history of Japan and loved Japanese customs, arts and the Chinese poems, moreover, he always endevored to understand the oriental people, and mastered the sixth grade Japanese reader when he was Director of the Scripps Institution of Oceanography at La Jolla. He had many friends among the Japanese geologists, paleontologists, biologists, and oceanographers who all enjoyed his friendship until his death. He was active in his field until 1947.

Trans. Proc. Palaeont. Soc. Japan N.S., No. 5 pp. 185—193, pl. 17, May 30, 1952.

216. DESCRIPTIONS OF THE PALEOGENE MOLLUSCS FROM SAKITO, NAGASAKI PREFECTURE, JAPAN[1)]

ATSUYUKI MIZUNO

University of Tokyo

長崎県崎戸附近古第三紀層産貝化石群について：長崎県崎戸町附近の西彼杵層群から得られた貝化石群の一部を検討する機会を得たので，ここにその結果を報告し，次の5新種の記載を行つた。*Crassatellites iesakai, Crassatellites elongatus, Venericardia vestioides, Venericardia inflata, Venericardia japonica.* 水野篤行

Long ago a number of Paleogene molluscs of Northern Kyūshū had been studied by M. YOKOYAMA (1911 and 1927) and T. NAGAO (1928 a, b), but their paleontological studies have not been so much performed as compared with the stratigraphical studies of this area, except the studies on fresh-water molluscs by both T. UEJI (1934 a, b) and K. SUZUKI (1941).

For the following reasons, the writer has considered some years that it must be necessary to make clear the characters of the fossils of this area;

1) The Japanese Paleogene strata being typically distributed in the coal fields of Northern Kyūshū.

2) Many fossils, which were recently collected from strata of "Paleogene" at several localities of Japan, being compared with the fossils from Northern Kyūshū.

3) The fossils of Northern Kyūshū being given very little attention except by a few investigators since their pioneer works by both YOKOYAMA and NAGAO and being never compared with rhe Paleogene species abroad.

4) Accordingly the analytical studies of these fossils being very significant in making clear the characters of the Japanese Paleogene faunas and in establishing the biochronological studies of the Japanese Paleogene.

Through the efforts of Mr. Sadao IESAKA, a geologist to the Sakito Coal-mine, Mitsubishi Mining Company, the writer had a chance to inspect a part of the marine molluscan fossils collected from the Nishisonoki group near the Sakito Coal-mine. Here the writer explains some of the descriptions of them, but their ecological or chronological studies will be given in future days.

The writer wishes to express many thanks to Mr. S. IESAKA for his offering of the specimens and data. Thanks are also due to Professor Takao SAKAMOTO and Assistant professor Fuyuji TAKAI in the Geological Institute, University of Tōkyō for looking over this manuscript.

According to H. MATSUSHITA (MATSUSHITA, 1949, p. 20), the stratigraphical succession of the Paleogene near Sakito is, in descending order, as follows;

1) Read Feb. 9, 1952; Received March 7, 1952.

1) 2)
Kurose group..... Ushikubi formation

4)
Ōshima formation
3) 5)
Nishisonoki group ..... Kakinoura formation
6)
Itanoura formation

8)
Sakito coal-bearing formation
7)
Matsushima group .....
9)
Nakado formation

.....Unconformity.....

10)
Terashima group.....Terashima formation
11) 12)
Akazaki group .....Yobikonose formation

.....Unconformity.....

Crystalline schists and granites

By T. SEKI's oral communication the Ōshima formation is subdivided into six members; namely Higire[13] alternation of sandstone and shale, *Lima* sandstone, Tōnoo[14] alternation of sandstone and shale, Tsurusaki[15] sandy shale, Okuura[16] shale and Fukuura[17] tuff, in descending order.

Both the Nishisonoki and Matushima groups are abundantly fossiliferous, the fossils being partly listed by H. MATSUSHITA (MATSUSHITA, 1949, p. 21.) and the present ones were gathered from the Ōshima and Itanoura formations.

The specific names here determined are shown in the following table.

List of Species (×.....Abundant)

× *Turritella* (s. str.) *karatsuensis* NAGAO	2 3
× *Turritella* (*Haustator*) *sakitoensis* NAGAO	3
Scala sp.	2
Polinices sp.	1
Neptunea (s. str.) *chikuzenensis* (NAGAO)	1
Dentalium sp.	2
Barbatia sp.	2
Glycymeris (s. str.) sp.	1
Crenella subfornicata NAGAO	2
× *Septifer* (s. str.) *nagaoi* OYAMA	2
Chlamys (*Coralichlamys*?) *rutteni* (MARTIN)	2
Recen (s. str.) *sp.*	2
× *Crassatellites* (*Eucrassatella*?) *iesakai* MIZUNO, sp. nov.	2
Crassatellites (*Eucrassatella*?) *elongatus* MIZUNO, sp. nov.	2
Crassatellites (*Eucrassatella*) *yabei* NAGAO	2
× *Venericardia* (*Cyclocardia*) *vestitoides* MIZUNO. sp. nov.	2
× *Venericardia* (*Cyclocardia*) *inflata* MIZUNO, sp. nov.	2
Venericardia (*Cyclocardia*) *siogamensis* NOMURA	2
× *Venericardia* (*Megacardita*) *japonica* MIZUNO, sp. nov.	2
Callista (s. str.) *hanzawai* (NAGAO)	2
Pitar (s. str.?) *matsumotoi* (NAGAO)	2
Venerupis (*Amigdala*) sp.	2

(18)
1 Hirabara, Kakinourashima, Sakito-machi.....Okuura shale, Ōshima formation.
(19) (20)
2 Takamine and Yokoura, Sakito-machi.....Fukura tuff, Ōshima formation.
(21)
3 Nakado, Sakito-machi .....Itanoura formation.

1) 黒瀬 2) 牛首 3) 西彼杵 4) 大島 5) 蛎浦 6) 板浦 7) 松島 8) 崎戸
9) 中戸 10) 寺島 11) 赤崎 12) 呼子瀬 13) 日切 14) 塔尾 15) 鶴崎
16) 奥浦 17) 福浦 18) 平原 19) 高嶺 20) 横浦 21) 中戸

Among the fossils listed above, the specifically identified ones are fifteen in number consisting of five new species, an upper Eocene one of Java, a Miocene one of Japan, and the remaining eight that are common with the "Ashiya fauna". In most cases, shells are irregularly deposited, detached and much crowded in strata, especially in the Fukuura tuff.

Descriptions of some fossils

GASTROPODA

Turritellidae

Genus *Turritella* LAMARCK, 1799

Turritella (s. str.) *sakitoensis* NAGAO

Plate 17, Figure 4.

1928. *Turritella sakitoensis*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser., Vol. XII, No. 1*, p. 101 (91), pl. 15, Figs. 34-40.

1950. *Turritella* (s. str.) *sakitoensis*, KOTAKA: *Short Paper, IGPS., No. 1*, p. 33, pl. 5, Fig. 14.

Several imperfect specimens were obtained.

Occurrence: Itanoura formation.

Turritella (*Haustator*) *karatsuensis* NAGAO

Plate 17, Figures 5a, b.

1928. *Turritella karatsuensis*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser. Vol. XII, No. 1*, p. 99 (89), pl. 15, Figs. 23-26.

1950. *Turritella* (*Haustator*) *karatsuensis*, KOTAKA: *Short, Paper, IGPS, No. 1*, p. 33, pl. 5, Fig. 15.

Specimens were mostly obtained from the Itanoura formation and only one from the Fukuura tuff, Ōshima formation. The former (fig. 5b) agrees well with the holotype, while the latter (fig. 5a) is distinguished from it, in being lower in height, and having fewer carinae on each whorls.

Occurrence: Itanoura formation and Fukuura tuff, Ōshima formation.

Buccinidae

Genus *Neptunea* (BOLTEN) RÖDING, 1798 (part)

Neptunea (s. str.) *chikuzenensis* (NAGAO)

1928. *Chrisodomus chikuzenensis*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser., Vol. XII, No. 1*, p. 108 (98), pl. 18, figs. 10-12.

Only one specimen, much deformed, was obtained.

Occurrence: Okuura shale.

BIVALVIA

Mytilidae

Genus *Septifer* RECLUZ, 1848

Septifer (s. str.) *nagaoi* OYAMA

Plate 17, Figures 1a-d.

1927. *Mytilus hirsutus*, YOKOYAMA: *Jour. Fac. Sci., Imp. Univ. Tokyo, Soc. II, Vol. II*, p. 187, pl. 50, figs. 3, 4,

1928. *Septifer* (?) sp., NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser., Vol. XII, No. 1*, p. 44 (34), pl. 1, figs. 7, 8.

1951. *Septifer nagaoi*, OYAMA: *Min. Geol., Vol. IV, Nos. 1, 2*, p. 56.

Description: Shell moderate or large, obliquely elongate-trigonal, acute at anterior, rounded in posterior part; ventral margin broadly arcuated; dorsal margin nearly straight, shorter than the preceding, making an obtuse angle with

broadly arcuated posterior margin on about 1/2 of length of shell. Beaks acute, terminal, situated at the anterior extremity of shell. Surface sculptured with radial riblets and concentric growth-lines, the former somewhat wrinkled, diverged near the ends. Inner margin finely crenulated.

Dimensions: Holotype (designated by K. OYAMA)...Length, 56.5 mm; Height, 26.5 mm.

Specimens at hand—	L. mm.	H. mm.
1	56.0	31.5
2	48.8	26.3
3	46.5	29.0
4	39.0	30.6

Comparison: As described by K. OYAMA *S. nagaoi* is similar to *S. biloculari*s (REEVE, 1858, pl. IX, fig. 42.), a living species, but they are different to each other both in the surface-sculpture and outline; the former having convex ventral margin, the latter having nearly straight or concave one.

The present species was first described by M. YOKOYAMA from Hako-jima, Nishisonoki-gun being referred to *Tricomya hirsuta* (LAMARCK) and in the next year by T. NAGAO to *Septifer* (?) sp. Recently, K. OYAMA gave a new name of *S. nagaoi* to the specimens figured by them, designating the specimen shown by M. YOKOYAMA to the holotype. Several specimens at hand all resemble them in outline.

Observations on all specimens show that the present species has two different forms which can be clearly recognized in the mature stage of growth; all the immature individuals show nearly same form, while the mature individuals differenciate into two forms as mentioned above; one is figured in Figs, 1a, 1b. which represents majority of the specimens, having slight variations in it and having a broader postero-dorsal part; another is figured in Figs. 1c, 1d, which represents a few specimens, having a narrower one, as is shown by the holotype. They owe these variations to the difference of the rate of growth on the postero-dorsal part of shell.

Occurrence: Fukuura tuff.

Genus *Crenella* BROWN, 1827

Crenella subfornicata NAGAO

1928. *Crenella subfornicata*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser., Vol. XII, No. 1*, p. 46 (36), pl. 5, figs. 8, 9.

Only one specimen, very small and ill-preserved.

Occurrence: Fukuura tuff.

Pectinidae

Genus *Chlamys* RÖDING, 1798

Chlamys (*Coralichlamys*?) *rutteni* MARTIN

Plate 17, Figure 6.

1914. *Chlamys* (s. str.) *rutteni*, MARTIN: *Samml. Geol. Reichs.-Mus. Leiden, n. f., Bd. II, Ht. 4*, p. 182, taf. 7, figs. 188, 188a.

Only one outer impression of right valve which is broken in the anterior part, measuring 12.0 mm. in length and 12.5 mm. in height.

C. rutteni was described by K. MARTIN from the upper Eocene Nanggulan formation in Java, and is distinguished from the other species of *Chlamys* in having a smaller shell and narrower radial ribs which are twenty-seven in number. The ribs are faintly nodose regularly arranged, and separated by broader valleys. The present specimen has the above-mentioned characters,

though larger than the holotype.

Occurrence: Fukuura tuff.

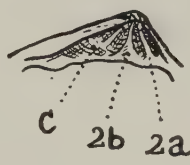
Crassatellitidae

Genus *Crassatellites* KRÜGER, 1823

Crassatellites (Eucrassatella?) iesakai MIZUNO, sp. nov.

Plate 17, Figures 2a-d, Text-figure A.

Description: Shell small, somewhat compressed, transversely oblong, inequilateral; ventral margin slightly arcuated, the anterior narrowly rounded; posterior somewhat subtruncated; antero- and postero-dorsal margins almost symmetrically descending from the beak, making an angle of about 120° to each other, the former nearly straight, the latter faintly concave, shorter than the former. Beaks not prominent, pointed, lying at about anterior 3/7 of shell-length. Surface sculpturd with coarse concentric ribs, about 20, forming striking ridges. Hinge relatively large, triangular: teeth on the left valve as follows; 2a thin, oblique; 2b thin, prominent and nearly perpendicular; clarge, trianguiar, relatevely shallow, separated into two areas by obsolete ridge on the posterior part of c. Inner margin of shell not crenulated.



Text-figure A. Sketch showing the hinge of *Crassatellites iesakai*.

Dimensions	Paratype 1	Holotype	Paratype 2	P. 3	P. 4
Length (mm.)	24.0	19.0	18.0	18.0	16.4
Height (mm.)	16.0	12.0	12.5	12.3	11.2
Thickness (mm.)	?	6.0	6.0	5.0	5.0

Comparison: *C. iesakai* is similar to *C. bellula* (A. AD.) (CLESSIN, 1886, p. 35, taf. 6, fig. 6) and *C. nanus* (AD. et RVE.) (CLESSIN, 1886. p. 15. taf. 6. fig. 3) which are living now, but differs in the following respects; *C. nanus* having a smaller and higher shell, and *C. bellula* having finer growth-lines and the both having crenulated inner margins. In comparison with *C. pauxilla* (YOKOYAMA) (YOKOYAMA, 1925, p. 122, pl. 15, figs. 8-11.), described from the Tertiary of Chichibu, Japan, the new species has finer growth-lines, though they resembles with one another in outline. *C. yabei* NAGAO, the important species in the "Ashiya fauna", can be clearly distinguished from the new species, in having larger and more crooked shell and more smooth surface.

Many specimens at hand are slightly variable in outline. The phenomenon, that is unrecognizable on a younger shell, seems to be due to the difference of rate of growth on some parts of shell when individuals become adult, as in the case of *Septifer nagaoi*. The specimen figured by T. NAGAO (NAGAO, 1928b, pl. 3, fig. 19.), which was referred to *C. yabei* by him, is considered as a mature form of *C. iesakai*.

The name is dedicated to Mr. S. IESAKA, who sent the specimens to the writer.

Occurrence: Fukuura tuff.

Crassatellites (*Eucrassatella*?) *elongatus* MIZUNO, sp. nov.

Plate 17, Figure 3.

Description: Shell small, inflated, transversely elongated, ovate-trigonal; ventral margin broadly arcuated, obliquely ascending to narrowly rounded anterior margin, and rectangularly cut by sharply truncated posterior margin; Antero-dorsal margin concave, on about 1/2 of postero-dorsal margin in length, the latter nearly straight, obliquely descending behind beak; from beak striking ridge running to postero-ventral corner. Beaks prominent, pointed, incurved, slightly prosogyrate, lying at anterier 1/3 of shell. Surface sculptured with concentric ribs, equally coarse and striking as those of the preceding species. Lunule broad, deep and lanceolate; escutcheon narrow, long. Inner margin not crenulated.

Dimensions: Holotype—Lentgh, 22.5 mm.; Height, 13.0 mm.: Thickness, 8.6 mm.

Comparison: *C. elongatus* is somewhat similar to *C. inconspisuus* NAGAO from the Paleogene of Northern Kyushu, but the new species is more inflated and more oblique in form and more prosogyrate in beaks. *C. inconspicuus* (?) NAGAO figured by T. NAGAO, (NAGAO, 1928, pl. 3, fig. 24) is referred to *C. elongatus*.

Crassatellites (*Eucrassatella*) *yabei* NAGAO

1928. *Crassatellites yabei*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd Ser., Vol. XII, No. 1*, p. 48 (38), pl. 2, figs. 17-20, 23-28, pl. 3, figs. 5, 6, 10-12, 23-24.

Few imperfect specimens are at hand. In comparison with the holotype they are all smaller and have coarser ribs.

Occurrence: Fukuura tuff.

Carditidae

Genus *Venericardia* LAMARCK, 1801

Venericardia (*Cyclocardia*) *vestitoides* MIZUNO, sp. nov.

Plate 17, Figures 7a-c.

Description: Shell small in size, round-trigonal, longer than high, inequilateral, inflated at umbonal area; ventral margin strongly arcuated; antero-dorsal margin slightly concave, shorter than the postero-dorsal, the latter somewhat convex, gradually continuing to ventral margin, and making an angle of about 120° with the antero-dorsal at umbonal area. Beaks large, prominent, pointed, slightly prosogyrate, situated at anterior 2/5 of length of shell. Surface sculptured with radial strong ribs and concentric growth-lines, the former about 15, strongly noded, and separated by narrower and deep valleys. Lunule short, deep; escutcheon not apparent.

Dimensions: Holotype—Length, 28.0 mm.; Height, 23.1 mm.; Thickness (single valve), 5.0 mm. Paratype 1—Length, ?; Height, 23.5 mm; Thickness (s. v.), 5.0 mm. Paratype 2—Length, 21.5 mm.; Height, 19.0 mm.; Thickness (s. v.), 3.5 mm.

Comparison: *V. vestitoides* resembles *V. vestita* (DESH.) (CLESSIN, 1888, p. 32, taf. 12, fig. 8, 9.), now living in the boreal sea, in outline, but differs from it in having a larger shell and fewer ribs. Also it differs from *V. matheroni* (MAYER) (COSSMANN et PAYROT, p. 60,

pl. 4, figs. 9–12.); the Helvetian species in France, in having fewer ribs, though they are similar to each other in outline. In comparison with *V. mandaica* (YOKOYAMA) (YOKOYAMA, 1911, p. 9, pl. 2, figs. 8–11.) from the lower Paleogene of Northern Kyūshū, the present new species is larger in apical angle, fewer in number of ribs and more elongated in its postero-ventral part.

Several specimens were obtained.

Occurrence: Fukuura tuff.

Venericardia (*Cyclocardia*) *inflata* MIZUNO, sp. nov.

Plate 17, Figures 8a, b.

Description: Shell, inflated, trigonal, inequilateral; ventral margin convex, antero-dorsal margin obliquely descending from beak to make a small semicircle with ventral margin, the postero-dorsal slightly convex, making an angle of about 90° with the antero-dorsal. Beaks prominent, acute, incurved. Surface sculptured with radial ribs and concentric growth-lines, the former 15 or 16 in number, nearly straight, separated by narrower valleys.

Dimensions: Holotype—Length, 21.4 mm.; Height, 20.5 mm,; Thickness (single valve), 5.0 mm.

Comparison: The new species resembles *V. veltina* (SMITH.) (CLESSIN, 1888, p. 12, pl. 1, figs. 7, 8.), a living species near Mexico, in the strong inflation and number of ribs, but distinguished from it in more irregular outline. *V. siogamensis* NOMURA is also similar to *V. inflata*, but the latter has more trigonal form and fewer ribs.

A few specimens were obtained.

Occurrence: Fukuura tuff.

Venericardia (*Cyclocardia*) *siogamensis* NOMURA

Plate 17, Figure 9.

1935. *Venericardia siogamensis*, NOMURA: *Saito Hoon-Kai Mus. Res. Bull., No. 6*, p. 212, pl. 17 (2), figs. 8–11.

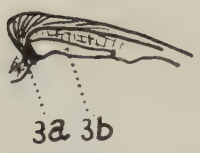
Several specimens at hand, which are identified with *V. siogamensis*, are more or less variable in outline, but resembles the holotype in having a trigonol form and 18–20 ribs, though differs from it in the convex postero-dorsal margin. The type specimen of the species was described from the "Upper shell-beds" in the vicinity of Shiogama, Miyagi Pref., Japan.

Occurrence: Fukuura tuff.

Venericardia (*Megacardita*) *japonica* MIZUNO, sp. nov.

Plate 17, Figures 10a, b, Text-figure B.

Description:—Shell small, moderately inflated, transversely elongated, ovate, inequilateral; ventral margin broadly arcuated, gradually ascending to anterior and posterior margins, both being narrowly rounded nearly in the same degree; antero-dorsal margin very short, the postero-dorsal very long, slightly convex. Beaks prominent, pointed, incurved, prosogyrate, lying at anterior 1/4 of shell. Surface sculptured with radial ribs 18 or 19 in number, separated by narrower valleys. Hinge relatively small; teeth on right valve as follows; 3a approaching to lunule border, slightly oblique, small, short; 3b very oblique, elongated backwards, strongly prominent, somewhat acute at the posterior end.



Text-figure B. Sketch showing the hinge of *Venericardia japonica*.

Dimensions:—Holotype.....Length, 25.6 mm.; Height, 18.5mm.; Thickness (single valve), 6.0mm.

Comparison:—*V. japonica* differs from *V. ferruginosa* in having longer form and much ribs, and from *V. laticostata* (REEVE, 1845, pl. 7, figs. 36a–d.) in being longer. *V. jouanneti dertolonga* SACCO, (SACCO, 1899, p. 11, tav. 3, figs. 15, 16), the Tortonian and upper Helvetian species of Italy, resembles the new species in outline, but the former has broader and fewer ribs.

Observations of the holotype and many paratype show that the young individals of the species are shorter, more trigonal in outline and less inflated and the growth of shell accompanies the elongation, rounding and inflation of shell. The holotype is maturely grown form.

V. (M.) n. sp. reported from the Kamiyokose formation in Chichibu, Japan, by K. WATANABE etc. (WATANABE, ARAI & HAYASHI, 1950, p. 87. pl. 2. fig. 10) is thought as the similar species to the new species.

Occurrence: Fukuura tuff.

Veneridae

Genus *Callista* POLI, 1791

Callista (s. str.) *hanzawai* (NAGAO)

1928. *Macrocallista hanzawai*, NAGAO: *Sci. Rep., Tohoku Imp. Univ., 2nd. Ser., Vol. XII, No. 1*, p. 69 (59), pl. 11, figs. 16, 18, 21–24, pl., 13, figs. 7, 8, 16 (?) 17.

Very deformed specimens were obtained.

Occurrence: Fukuura tuff.

Genus *Pitar* ROMER, 1857

Pitar (s. str.) *matsumotoi* (NAGAO)

1928. *Pitaria matsumotoi*, NAGAO: *Sci. Rep., Tohoku Imp. Univ. 2nd. Ser., Vol. XII, No. 1*, p. 73, (6), pl. 11, fig. 17, pl, 13. figs. 4–6.

Several specimens at hand are scarcely distinguished from the holotype of the present species shown by T. NAGAO.

Occurrence: Fukuura tuff.

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1 a
1 b
2 a
2 b
2 c
2 d
1 d
1 c
3
4
5 a
5 b
7 a
6
7 b
8 a
7 c
9
8 b
10 a
10 b

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Explanation of Plate 17

Figs. 4a–d. *Septifer* (*s. str.*) *nagaoi* OYAMA
- a. Internal mould of the right valve, ×1.
- b. Internal mould of the right valve, ×1.
- c. Intermal mould of the left valve, ×1. (Holotype designated by K. OYAMA, reproduced from YOKOYAMA's figure, 1927, Pl. L, Fig. 4.)
- d. Internal mould of the left valve, ×1.

Figs. 2a-d. *Crassatellites* (*Eucrassatella*?) *iesakai* MIZUNO, sp. sp. nov.
- a. Internal mould of the left valve, ×1.5.
- b. Intenal mould of the right valve, ×1.5, the holotype.
- c. Internal mould of the right valve, ×1.5.
- d. Internal mould of the right valve, × 1.5.

Fig. 3. *Crassatellites* (*Eucrassatella*?) *elongatus* MIZUNO, sp. nov.
Internal mould of the left valve, ×1.5, the holotype.

Fig. 4. *Turritella* (*Hausiator*) *sakitoensis* NAGAO
Internal mould.

Figs. 5a, b. *Turritella* (*s. str.*) *karatsuensis* NAGAO
- a. External cast from the Fukuura tuff. ×1.
- b. A fragment of shell from the Itanoura formation. ×1.

Fig. 6. *Chlamys* (*Coralichlamys*? *rutteni* MARTIN
External cast of the right valve, ×1,5.

Figs. 7a-c. *Venericardia* (*Cyclocardia*) *vestitoides* MIZUNO, sp. nov.
- a. Internal mould of the left valve, ×1.5.
- b. Internal mould of the right vale, ×1, the holotype.
- c. Internal mould of the left valve, ×1.

Figs. 8a, b. *Venericardia* (*Cycolcaadia*) *inflata* MIZUNO, sp. nov.
- a. Internal mould of the left valve, ×1.5.
- b. Internal mould of the left valve, ×1.5, the holotype.

Fig. 9. *Venericardia* (*Cyclocardia*) *siogamensis* NOMURA
Internal mould of the right valve, ×1.5.

Figs. 10a, b. *Venericardia* (*Megacardita*) *japonica* MIZUNO, sp. nov.
- a. Internal mould of the left valve, ×1.5, the holotype.
- b. Internal mould of the left valve, ×1.5.

All the specimens are kept in the Geological Institute, University of Tōkyō.

PROCEEDINGS OF THE PALAEONTOLOGICAL SOCIETY OF JAPAN

「日本古生物学会第49回例会」昭和27年2月9日九州大学理学部地質学教室に於て開催す（参会者14名）。講演者並に講演題目次の如し。

On the Two New Species of Fossil *Juglans* .....Seido ENDO
朝鮮産第三紀植物化石—3（代読） .....藤岡一男
大村灣産有孔虫類について .....首藤次男
New *Boultonia* and other Fusulinids associated with Calcareous Algae from Northern Tai (Siam)（代読） ..... Kenji KONISHI
The Lower Carboniferous Kakisako formation of Southern Kyushu, with a Note on Some New Corals and Fusulinids .....Kametoshi KANMERA
Pennsylvanian Fusulinids from the Akiyoshi Limestone.....Ryuzo TORIYAMA
Halysites shikokuensis, sp. nov. from Yokokurayama, Kôchi-ken...Mitsuo NODA
A New Tertiary Species of *Echinarachnius* from Hokkaido（代読） ..... Ichiro HAYASAKA and Matsutaro SHIBATA
島原半島大江層産介化石に就いて ....天野昌久・井上正昭
佐渡沢根層産のホタテガイ科の化石（代読）.....歌代 勤・大森昌衛
The Discovery of New Miocene Fauna in the Northern Part of Nishitagawa Coal-Field, Yamagata Prefecture, Japan（代読）.....Toshimasa TANAI and Kenzo OGASAWARA
長崎県崎戸附近，西彼杵層群の貝化石群について（代読） .....水野篤行
Discovery of Cretaceous Ammonites from the undivided Mesozoic Complex of Shikoku.....Tatsuro MATSUMOTO, Toshio KIMURA & Jiro KATTO
Some Non-marine Fossils from the lower Cretaceous Formations of the Yatsushiro District, Kyushu .... Tatsuro MATSUMOTO
Belemnites from Lower Cretaceous Deposits of Miyako District（代読）... ..... Tetsuro HANAI
Bunkokuda（新属）と Bunkokudidae（新科）について（代読） .....小林貞一
長門産の三疊紀貝蝦石二新種（代読）小林貞一
現生貝蝦の殻の種属及び雌雄による変化（代読） .....小林貞一・楠見 久
On the Two Fossil Elephants from Kyushu Island, Japan. .... Fuyuji TAKA & Masaaki INOUE

「日本地質学会第59年総会に於ける日本古生物学会学術講演会」昭和27年4月6日大分大学学芸学部に於て開催す。講演者並に講演題目次の如し。

北海道厚岸灣及び厚岸湖に於ける有孔虫殻の堆積 .....森島正夫・千地万造
北上山地坂本沢及び叶倉沢の紡錘虫 .... 森川六郎
岩手県気仙郡矢作村地方の紡錘虫化石に就いて .....千坂武志
Astriclypeus に就いて .....森下 晶
北海道産 *Yoldia* 属に就いて .... 早坂一郎・魚住 悟
Lebens spuren の研究（其の1).....陶山国男
Portunites と戸刈層 *Ovalipes* .....今泉力藏
九州北西部より産出した鮮新世型 *Stegodon* に就いて .....高井冬二・井上正昭
デスモスチルスの研究（第2報)..... 矢部長克・高井冬二・井尻正二・鹿間時夫
開灤炭田の植物化石に就いて .....高橋年次
岩室累層の植物群 .....木村達明
手取累層群より双子葉植物化石及び赤色凝灰岩の発見とその意義 .....前田四郎
大道谷植物化石に就いて .... 遠藤誠道・天野昌久

Announcement

Bibliography of Japanese Palaeontology and Related Sciences
1941–1950

including papers published by Japanese authors as well as those by others which concern Japan and its surroundings

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CONSTITUTION
of the
PALAEONTOLOGICAL SOCIETY OF JAPAN

ARTICLE 1. Name

The Society shall be known as the Palaeontological Society of Japan. The Society is a section of the Geological Society of Japan.

ARTICLE 2. Object

The object of the Society shall be to promote the study of palaeontology and related sciences.

ARTICLE 3. Achievement

The Society in order to execute Article 2 shall (a) issue the Society journal and other publications, (b) hold or sponsor scientific lectures and meetings, and (c) sponsor collecting or field trips, and lectures.

ARTICLE 4. Membership

The Society shall be composed of persons who are active of interested in palaeontology or related sciences, and shall be known as regular members, honorary members, and patrons.

ARTICLE 5. The members of the Society shall be obliged to pay annual dues to the Society, for which they shall enjoy the privilege of receiving the Society's journal and of submitting papers which have been read and discussed at the meetings for publication in the Society's journal.

ARTICLE 6. Administration

The Society shall have the following organizations for its administration.

(a) General meeting. The general meeting shall be composed of the Society members. More than one tenth of regular members shall be present to hold general meetings. Administrative affairs shall be decided during the general meeting.

(b) President. The president shall be elected from among the regular members. The president shall represent the Society and supervise its business matters.

(c) Council. The council shall be composed of councillors who are elected from among the regular members. The council shall discuss administrative affairs.

(d) Business council. The business councillors shall be elected from among the council members, and shall administer business affairs.

(e) Officers shall be elected by vote of returned mail ballots, as a general rule.

ARTICLE 7. Amendments to the constitution shall be by decision of the general meeting.

By-Laws and Administration

ARTICLE 8. The Society's journal shall be issued three times a year.

ARTICLE 9. Regular members shall be persons who have knowledge, experience, or interest in palaeontology or related sciences.

ARTICLE 10. Patrons shall be selected individuals or organizations who give special support to the objectives of the Society.

ARTICLE 11. Honorary members shall be persons of distinguished achievement in palaeontology. The council shall nominate honorary members for decision by the general meeting.

ARTICLE 12. Applicants for membership to the Society shall submit their full name, mailing address, date of birth, occupation, and name of school from which they graduated.

Dues

ARTICLE 13. Rates for annual dues of the Society shall be decided during the general meeting. Annual dues for regular members is Yen 400.00 (domestic members) and U.S. $2.00 (foreign members). Patrons are individuals or organizations donating more than Yen 10,000.00 annually. Honorary members are free from obligations.

ARTICLE 14. The Society income shall be from membership dues and bestowals.

ARTICLE 15. The Society shall have one chairman, fifteen councillors, and several business councillors, whose term of office shall be one year. They may be re-elected.

Addendum

ARTICLE 1. There shall be four business councillors for the present.

ARTICLE 2. The Society journal shall be issued twice a year for the present.